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ABSTRACT OF THE DISCLOSURE

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A multiple-wavelength ultrashort-pulse laser system includes a laser generator producing ultrashort pulses at a fixed wavelength, and at least one and preferably a plurality of wavelength-conversion channels. Preferably, a fiber laser system is used for generating single-wavelength, ultrashort pulses. An optical split switch matrix directs the pulses from the laser generator into at least one of the wavelength conversion channels. An optical combining switch matrix is disposed downstream of the wavelength-conversion channels and combines outputs from separate wavelength-conversion channels into a single output channel. Preferably, waveguides formed in a ferroelectric substrate by titanium indiffusion (TI) and/or proton exchange (PE) form the wavelength-conversion channels and the splitting and combining matrices. Use of the waveguide allows efficient optical parametric generation to occur in the wavelength-conversion channels at pulse energies achievable with a mode-locked laser source. The multiple-wavelength laser system can replace a plurality of different, single-wavelength laser systems. In its simplest form, the system can be used to convert the laser wavelength to a more favorable wavelength. For example, pulses generated at $1.55\mu\text{m}$ by a mode-locked erbium fiber laser can be converted to $1.3\mu\text{m}$ for use in optical coherence tomography or to wavelengths suitable for use in a display, printing or machining system.

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